High Performance Microstrip Monopole Antenna with Loaded Metamaterial Wire Medium Superstrate

Ahmad H. Abdelgwad, Tarek M. Said*

Department of Electrical Engineering, Fayoum University, Fayoum 63514, Egypt

ABSTRACT A novel design of printed monopole antenna loaded with wire medium is developed for radar applications. The advocated design aims to simultaneously enhance the gain and bandwidth of the proposed geometry. The proposed antenna is composed of a circular patch etched with double C-shaped slots and the ground is defected to achieve wide bandwidth. Wire medium superstrate and a metal reflector are implemented to provide high gain. The promising tunable wire medium superstrate consists of a periodic array of parallel metallic wires arranged in a rectangular pattern that mimic the behavior of epsilon-near-to-zero (ENZ) metamaterial. This medium is suspended at a distance of a quarter-wavelength in air above the antenna to provide the optimum gain and reduce the side lobes level. Prototype of the optimized antenna is fabricated using Rogers's substrate to offer −10 dB bandwidth over the entire frequency range (900 MHz to 2.85 GHz). Details of the design process are investigated through full wave electromagnetic simulations performed by CST software. Experimental results of the fabricated prototype are presented and also compared with simulation results where an appreciable agreement between them is demonstrated.

KEYWORDS Defected ground structure, microstrip antennas, slotted patch, wire medium superstrate.

*Address all correspondence to: Tarek M. Said, Fayoum University, Faculty Group, Electrical Engineering Department, E-mail: tms02@fayoum.edu.eg